
ANNUAL REPORT ON THE ENVIRONMENT

CHAPTER IV

**DEER
MANAGEMENT
IN FAIRFAX
COUNTY**

IV. DEER MANAGEMENT IN FAIRFAX COUNTY

A. OVERVIEW

The adverse impacts of white-tailed deer in Fairfax County are readily recognized as a problem by many of its residents. While the "problem" is seen from a variety of perspectives, there is a general consensus that the root cause is "overabundance" of deer in many local areas. There is also a general public perception that a deer management program is needed to address the "problem".

The road to an acceptable deer management solution, however, is not so easily determined. Some of the factors essential to a solution are subject to strenuous debate and attract a wide spectrum of opinion. For example, what is the optimum population level, and if population reduction is required, what means shall be used? The sport hunting community, recreational nature lovers, residential property owners, environmental preservationists, and animal rights/welfare groups have differing viewpoints on these issues.

B. BACKGROUND

1. Are Deer Overabundant in Fairfax County?

Caughly (1981) defined four contexts in which the term "overabundance" can be understood when referring to an animal species population. These definitions have since been widely used by most serious scholars in the wildlife management field and by public administrators responsible for wildlife management programs.

1. When the animals threaten human life or livelihood.
2. When the animals depress the density of, or destroy, particular favored species.
3. When the animals are too numerous for their own good.
4. When their numbers cause ecosystem dysfunction.

Where does Fairfax County stand vis-a-vis these four criteria? The available data strongly (even overwhelmingly) suggest that:

1. We experience an unacceptable number of deer-vehicle collisions resulting in deaths, injuries, and major property damage. Owners of commercial agricultural and nursery enterprises suffer substantial damage.
2. In many areas of the County, deer routinely leave their enclaves of "natural"

habitat to forage in nearby gardens and yards causing widespread damage to landscaping and thus major economic loss to property owners. Through voracious browsing, deer are rapidly eradicating numerous threatened and endangered botanical species from the "natural" habitat. In addition, this loss of plant habitat is adversely affecting numerous vertebrate and invertebrate species of smaller physical size, such as many bird species, that are unable to compete with large herbivores.

3. Data for Fairfax County, based on Virginia Department of Game and Inland Fisheries (VDGIF) assessments spanning ten years, indicate that its various deer herds showed a single individual in excellent condition, a very few in good condition, most about evenly split between fair and poor condition, and a few emaciated individuals. This shows quite clearly that no longer can the available habitats meet the minimum nutritional requirements that would maintain the deer population in sound health. A 125-pound deer requires approximately 6.5 pounds of forage per day or some 2,370 pounds of vegetation per year.
4. Many of our parklands and stream valleys show severe browse lines, nearly total eradication of understory, and loss of numerous species upon which the continuous process of woodland regeneration is dependent. These changes in turn lead to the inevitable loss of a wide variety of animal species. Thus, our remaining natural ecosystem is being severely deformed through the eruption of a single species that has become overdominant in the food chain.

According to each of Caughly's four criteria, it is apparent that Fairfax County has a serious overabundance of deer. In recognition of the public perception of a significant problem, the Board of Supervisors directed County staff to develop a plan for deer management. In October of 1997, County staff contracted with a consulting firm to "study and review existing data on deer, deer-habitat interactions, deer-human conflicts, and deer management proposals within the County." Staff also asked the consultants to recommend suitable methods for addressing the various problem areas. These studies and recommendations were presented in the Consultants Report (Natural Resource Consultants, December 1997). In 1998, the County created a new position and appointed a Wildlife Biologist who had broad experience with Fairfax County parks and parkland issues. In the summer of 1999, the County Executive convened an ad hoc Deer Management Committee of experts and stakeholders to discuss and evaluate the plan drawn up by the staff and the early implementation efforts. The report of this committee and its recommendations were forwarded to the Board of Supervisors in September 1999 in advance of the season of peak deer problems, which occurs in the fall. The Board of Supervisors approved recommended measures to reduce the deer population to more sustainable and less destructive levels. Since then, the deer management program has made substantial progress in achieving significant population reductions in some of our most threatened parklands.

2. A Description of the Problem

a. Data on Deer Abundance in Fairfax County

To begin this discussion, the terms overabundance and overpopulation should be distinguished. Overabundance refers to population levels that have adverse impacts on the community and other species, while overpopulation refers to population levels of the species that are an imminent danger to itself through disease and starvation. This latter phenomenon is responsible for the population eruption and subsequent collapse of deer herds that has been a topic of scientific study for the past 60 years. While the following information supports a conclusion that deer are overabundant in Fairfax County, neither the data nor experts from a variety of sources have indicated that a level of overpopulation exists, though the relatively poor health of the County's deer suggest that we may be approaching overpopulation.

Data from the Virginia Department of Game and Inland Fisheries deer density surveys in Fairfax County parks prior to the County's deer management program showed deer densities from 90-419 deer/sq. mile (Table IV-1).

Table IV-1 Deer Density Surveys	
Location	Est. Deer/Square Mile
Huntley Meadow Park	90-114
Riverbend Park	213
Meadowlark Gardens Park	90-115
Bull Run Regional Park	419
Fort Belvoir	90
Mason Neck NWR	-

(Source: W. Dan Lovelace, Wildlife Biologist, Virginia Department of Game and Inland Fisheries.)

While the many of the data are limited, taken collectively, the observations of professional park staff, poor health of evaluated deer, and high deer densities indicate that deer are overabundant and are negatively impacting the ecology of sizeable areas of Fairfax County. Unfortunately, there are few reliable data available for densities and extent of damage on private lands and the adjacent small islands and corridors of

natural habitat. Even though the information available is primarily anecdotal, it is voluminous, and there is a general public perception of a significant and growing problem of deer overabundance.

b. Causes of Overabundance in Urban/Suburban Areas

i. Urbanization/Changes in Habitat

Over recent decades, Fairfax County has transformed from a largely agrarian and woodland area to a multifaceted employment, residential, and retail area. Nearly 1,000,000 people reside in the 399 square miles of the County. Of these 399 square miles, about 140 square miles are wooded and open land, and some three square miles is remaining agricultural land. This change from an agrarian area to a developed one has markedly decreased the amount of land usually regarded as suitable for deer habitat and has changed their food sources and movement patterns. This urban/suburban habitat of the County provides a fairly good nutritional base for deer, including manicured lawns, athletic fields, college campuses, golf courses, and landscaped residential communities.

Overabundance is particularly common where the course of development has left protected "islands" or "corridors" of deer habitat in or near urban and suburban areas. As the development process reduces the area of natural habitat, deer are forced into these remaining islands and corridors at very high population densities. Because the deer then deplete the forage plants in these enclaves, they venture out into the surrounding developed community in search of food. In such situations, conflicts with humans frequently arise in the form of deer-vehicle collisions and depredations on gardens and ornamental plantings (Flyger et al, 1983; Cypher & Cypher, 1988). Moreover, in such situations, natural predators (e.g., wolves, bobcats, mountain lions) have normally long since been eliminated and hunting is usually prohibited.

ii. Loss of Predators

The precolonial levels of deer in Virginia could be attributed to predation by bobcats, black bears, eastern gray wolves, and eastern mountain lions, in addition to human impacts of Native American hunters. While none of these predators depended solely on deer, the deer/predator interactions and the added effects of hunters kept the levels low. Increasing human populations and land development has virtually eliminated wildlife predators from the County. In the first half of this century, hunting had reduced the deer population to very low levels. However in the latter half of this century, with growing human population and reduction of huntable habitats, recreational hunting has almost disappeared in the County. While the number of deer harvested through "Out of Season Kill Permits" has increased in recent years (Table IV-2), the combination of seasonal hunting and

out-of-season kill permits does not affect the deer population at sufficient levels to prevent significant deer/human conflicts or ecological damage.

Table IV-2 Out of Season Kill Permits Issued For Deer Damage in Fairfax County Virginia Department of Game and Inland Fisheries		
Year	Permits	Number Taken
1989	5	25
1990	3	4
1991	19	41
1992	18	43
1993	42	222
1994	31	131
1995	65	193
1996	165	244
1997	147	310
1998	157	297
1999	216	377
2000	197	263

(Source: Mark Pritt and Jerry Sims, Wildlife Biologists, Virginia Department of Game and Inland Fisheries.)

c. Problems Created by Overabundance

i. Ecological Impact

Effects of a persistent and overabundant deer population include the loss of biodiversity and a negative effect on ecological and biotic systems. These can be seen in a declining understory (lower height plants and shrubs that serve as a food source for birds) and the appearance of browse lines, which occur when deer eat

almost all the vegetation within their reach and the woods develop a “line” at the top of their reach. While few detailed deer/forest impact studies have been performed in the County, in a report to the Division of Animal Control, Fairfax County Police Department, the Superintendent of Administration of the Northern Virginia Regional Park Authority noted that “the ever present browse line had now become a common sight in most of our parks. The deer have eaten all of the herbaceous and woody plant growth within their reach. This has eliminated an entire stratum of habitat from the parks.”

The browse line and loss of understory are not the only indications of this ecological impact. There is an abundance of technical literature reporting the effects of a high deer population on plant communities when the lower ecological carrying capacity (see page 10) is exceeded. However, the apparent poor health of the County’s deer indicates a level of deer density that reportedly exceeds even the higher biological carrying capacity. There are also numerous studies documenting the negative effects of overabundant deer on wildlife species. For other vertebrates, this may occur through direct competition for food sources or more often by altering the habitat. For example, in some areas of the County the number of species of birds has markedly diminished through loss of the necessary habitat due to excessive browsing by deer.

As noted in the 1997 Consultant Report and throughout the scientific literature, “The consequences of a persistent, overabundant deer problem can be long-term loss of biodiversity and negative impact to functioning ecological and biotic processes.” We have already begun to see a loss of biodiversity that will ultimately lead to a loss of ecosystem stability with far more widespread and serious effects than the shorter-term effects of overabundant deer.

ii. Property Loss and Damage (Vehicular, Plantings)

There currently is no accurate system to track data regarding the total property loss due to deer/vehicle collisions. The Fairfax County Police Department does an excellent job of analysis of the data on deer-vehicle collisions that require a police presence in their aftermath or that are otherwise reported. The numbers appear to have increased, but the data do not show a consistent trend (Table IV-3). For those accidents tabulated from January 1998 through May 2001, the average damage per vehicle was about \$2,300. Over this same period, the Virginia Department of Transportation picked up 3,450 carcasses of deer killed in vehicular collisions from rights-of-way in the County. However, police and highway experts estimate that only 20-25 percent of deer impacting vehicles die at the scene (i.e., on the road or in the right-of-way); many receive injuries that are soon fatal, but die in the woods or in a nearby yard. Thus, a reasonable estimate would indicate some 13,800-17,250 deer-vehicle collisions in the County during this period. One can reasonably infer that many, if not most, of these collisions result in property

damage to the vehicle.

Table IV-3 Deer-Vehicle Collisions in Fairfax County								
	1993	1994	1995	1996	1997	1998	1999	2000
Non-Injury	154	149	127	157	168	144	177	144
Injury Crashes	6	10	6	20	17	23	18	17
Fatal Crashes	0	0	0	0	1	0	1	0
Total	160	159	133	177	186	167	196	161

(Source: Report prepared by Michael Uram, Fairfax County Police Department.)

County personnel report an increasing number of complaints of damage to native and ornamental plants in Fairfax County. Referring again to the “Out of Season Kill Permits Issued for Deer Damage” (Table IV-2), an indication is given of homeowner attempts to address property loss primarily thought to be ornamental in nature. Further, although numerous deer management programs are available, such as planting less preferred species and fencing, the effectiveness of these methods declines dramatically with increased deer densities leading to declining food sources and willingness of deer to eat even undesirable plants. These activities may also tend to increase vehicular incidents, as deer must look farther afield for food sources.

iii. Disease

Another problem associated with deer overabundance is the prevalence of Lyme Disease. Confirmed cases of Lyme Disease underwent a sharp increase through June, 1997 (Table IV-4). The decrease of the next two years may be attributable to greater public awareness of the threat represented by deer ticks and greater use of proper preventive measures when hiking and working in wooded areas. The recent availability of a vaccine against Lyme Disease may actually account for the significant upturn in reported cases during the last ten months due to further heightening of public awareness and a corresponding increase in the number of persons seeking testing and diagnosis. It is unclear, however, whether a decrease

in deer population will lead to a corresponding decrease in Lyme Disease cases. Other animals can be carriers and may inhabit areas within which deer populations decline.

Table IV-4 Reported Lyme Disease Cases Meeting Centers for Disease Control (CDC) Case Definition Program Fairfax County		
Period Covered	Reported Cases	Contracted outside of Fairfax County
July 1994-June 1995	14	N.A.
July 1995-June 1996	22	N.A.
July 1996-June 1997	31	N.A.
July 1997-June 1998	16	8
July 1998-June 1999	13	9
July 1999-June 2000	50	8
July 2000-June 2001	51	9

(Source: Fairfax County Department of Health)

While it is true that vaccination of those intensively exposed to deer ticks is likely to result in a decline in human incidence, for the vast majority of the population, consistent use of ordinary preventive measures should be entirely adequate. In our Annual Report last year we noted the availability of the Lymrix, vaccine manufactured by Smith-Kline-Beecham. There is now more information available about the experience with this vaccine. Consult with your personal physician about the advisability of being vaccinated. Other sources of up-to-date information on this vaccine are the U. S. Public Health Service Centers for Disease Control and Prevention in Atlanta and the Food and Drug Administration in Rockville.

The Fairfax County Department of Health has available an excellent booklet entitled Preventing Tick-borne Diseases in Virginia. They also have a brochure titled Rabies and Animal Bites: What you should know and what you should do. Additional information is available through the Health Department section of the County web site www.co.fairfax.va.us.

C. ISSUES IN ADDRESSING THE PROBLEM

To effectively manage the deer population, the implications and interrelationships of population dynamics, carrying capacity, public opinion, and methods for management must be understood and incorporated into the program.

1. Understanding Population Dynamics

The concept of population dynamics is crucial to understanding the current problem and the development of a workable solution. There are no simple mathematical models that can be applied to determining the growth of the population of a species in a particular area, and the least complex deer management models and programs based on solely on nutritional deer carrying capacity (see section on carrying capacity below) consider neither the deer population's interactions with the human population nor its interactions with a biodiverse ecosystem.

One important concept to understand is that of home range. Deer show a strong attachment to a home range, and it has been shown that deer forcibly relocated often die of malnutrition even if food is accessible in their new habitats. When natural dispersal from the home range occurs, it is usually the younger males that migrate. This has four implications for Fairfax County deer management:

1. Deer often occupy a home range that can include both a park and the surrounding community or islands and corridors of "natural" habitat plus the yards and gardens of adjacent residential communities;
2. A dramatic decrease in one area will not necessarily result, in the short term, in an increased dispersal of deer from other areas into the depleted area, with a consequent lessening of population density in those other areas;
3. Deer cannot be eliminated from the County under today's conditions, because the deer surviving in surrounding home ranges will, in the long term, undergo natural dispersal and repopulate the depleted areas. This implies that parks and the surrounding areas must be managed as a unit and that solving the problem in one area does not automatically translate to another area; and
4. The recent emergence of epizootic hemorrhagic disease (EHD), a viral disease fatal to deer but posing no threat to humans, may be a significant factor in natural reduction of the deer population over the next several years. EHD has sometimes been implicated as a significant factor in the boom-bust cycle observed within deer populations that have been the subject of long-term study. Within the past year, 53 deer fatalities due to EHD have been diagnosed in the southeastern portion of the County, and these diagnosed cases probably represent only a small fraction of

those succumbing to the disease. Weather, the size and compactness of deer herds, and the overall health of the deer play a major role in EHD transmission. Thus, it is not possible to predict the future course of this disease within the County, except to note that it usually takes several years to run its course within a deer population and we appear to be in the early stages of an outbreak.

Other concepts that affect population dynamics include compensatory reproductive responses, survival, and predation. Again, it must be noted that deer management is not a simple mathematical equation; it must take into account many biological and behavioral factors, many of which are not fully understood, especially in an environment such as Fairfax County. For example, in many cases, as the size of an animal population decreases, the number of offspring increases despite the fact that food is becoming less adequate. This phenomenon leads to the population eruption-crash cycles that are widely discussed in the scientific literature. More complete data and an improved understanding of the unique characteristics of Fairfax County must be collected and considered as the management program evolves.

2. Determining Carrying Capacity Goals

Carrying capacity is the level of a population that can be supported by an ecosystem or tolerated by the community. To determine the appropriate population level as a goal for a management plan, it is essential to distinguish among the following:

1. Biological carrying capacity, i.e., a species specific level that is primarily concerned with the population that can be supported with the available nutritional resources;
2. Cultural carrying capacity, i.e., a level that is driven by human concerns (the population that can be tolerated by the community at large); and
3. Ecosystem carrying capacity, i.e., the population level that can be supported by an ecosystem without disturbance of its stability or reduction of its biodiversity.

The biological carrying capacity is a traditional view that has been widely used by fish and game departments where a primary concern is to maintain adequate stocks of deer for sport hunting, but it does not adequately account for the effects of relatively high population levels on the ecosystem in which the species resides. The cultural carrying capacity is defined by Ellingwood and Spingnesti (1986) as the maximum number of deer that can coexist compatibly with local human communities before conflicting with some human interest. This level is driven by human values, economics, and desires independent of ecological considerations. DeCalesta (1998) used the term diversity carrying capacity in a more restrictive sense than ecosystem carrying capacity, but both concepts consider the maximum species population density that does not negatively impact diversity of fauna or flora, including diversity of habitat structure as well as species richness. He contends that

deer impacts on biodiversity occur at population densities well below traditional definitions of ecosystem carrying capacity.

Thus, biological carrying capacity is the highest population density and is considerably in excess of cultural carrying capacity (human societal tolerance), which in turn accepts notably higher densities than ecosystem carrying capacity. Finally, diversity carrying capacity has the smallest maximum population density.

3. Considering Public Opinion

Goals for management and methods to use to reach those goals are very different issues; consensus or conflict among groups of constituencies may occur at either or both levels. Goals may vary from a biological carrying capacity level that meets hunting concerns to a much lower carrying capacity level based on an ecological or biodiversity perspective. Cultural carrying capacity may run the gamut of levels, depending on the varying values and tolerances of different constituencies within the community. Even where there is agreement on the level of deer density desired, the methods to reach those goals may be in dispute. Some groups may have a zero-tolerance for lethal means, whereas others may readily support managed hunts or sharpshooters.

As indicated in the 1997 Consultant Report, deer control action by the County should not be undertaken until it is determined that there is sufficient community and political support for it. Again, the need for data, this time in the form of public opinion surveys, is stressed. Additionally, the need to adequately educate the public about the issues is needed to ensure well-informed constituent responses.

D. METHODS FOR DEER POPULATION MANAGEMENT

1. Population Reduction Approaches

a. Let Nature Take its Course - Eruption/Collapse

This approach is based on using no human intervention to affect the deer population one way or the other. This has been studied by wildlife biologists for more than half a century. The findings are that the population goes through an eruptive phase with explosive population growth until it is far above biological carrying capacity. This is followed by eruptions of parasitic and infectious diseases (such as EHD) and by large-scale starvation, which causes the population to crash to perhaps 15-25 percent of its peak level. Thereupon, the herd recovers to begin the cycle anew. Some populations have been followed through five or six successive cycles. Although the deer population of Fairfax County can be considered to be in the early stages of the eruptive phase, it is well short of a peak. Public concerns about the current and expected future impacts on the community rule this out as an option.

b. Lethal Methods

i. Managed Hunting

Experiences with managed hunts over the past year indicate they have been highly cost effective in that revenue has exceeded costs for personnel and materials. This is in sharp contrast to their initial use in 1998, when costs were high and relatively few deer were taken. The dramatic upturn in the learning curve is very encouraging. Necessarily, managed hunts are conducted primarily in parkland, and while the amount of deer population reduction in these local areas is no doubt ecologically beneficial, in terms of absolute numbers it has been insufficient to make an immediate noticeable difference in the overall problem.

ii. Archery Hunting

Archery hunting has proven an effective and acceptable means of deer control in residential areas where use of firearms is deemed too hazardous. Archery is a quiet and short-range method, with most deer being taken within less than 100 feet. During the 1998 public hunting season, 789 deer were taken in Fairfax County, of which 597 were taken by archery and the remainder by shotgun. In 1999, archery accounted for 686 of the total of 1,046 deer, and in 2000 accounted for 626 of 1,028 deer. With out-of-season kill permits, archery can be used year-round, even in residential neighborhoods.

iii. Traditional Public Hunting

Under current restrictions outlined by VDGIF, the above figures show that traditional public hunting is not sufficient to address the problem, based on hunters' limited access to deer habitat and preference for antlered deer. Moreover, the habitat that is accessible is not where the major problem areas are located.

iv. Trap and Kill

This method has usually been conducted by darting with anesthetics and dispatching the animal by gunshot or a lethal drug. The former is less effective than sharpshooters while the latter leaves the meat unfit for human consumption. The use of drop nets and stun guns are explained in the 1997 Consultant Report as a possible lethal method. This method allows for release of non-targeted males and results in meat uncontaminated by drugs but is very cost inefficient.

v. Sharpshooters

The use of professional animal control personnel, police experts, or qualified and experienced volunteers has been proved to be a safe, cost-effective, and successful means of management if lethal methods are employed. Earlier experience with this method in Fairfax County has led to significant refinements and greatly improved cost-effectiveness, with a cost per deer taken ranging from \$4.15 to \$22.97. Once again, the number of deer removed from the population by this method is not sufficient to have more than a small local effect.

vi. Reintroduce Predators

The reintroduction of the usual species of deer predators into an urbanized setting such as Fairfax County is biologically unworkable and publicly unacceptable.

c. Nonlethal Methods

i. Trap and Relocate

Experiments with this approach have been largely unsuccessful due to high initial mortality (up to 85%) of the relocated deer. Moreover, there are few locations within a reasonable distance of this area that would accept relocated deer, since most nearby areas have similar problems. The use of drop nets and stun guns are suggested in the 1997 Consultant Report as a possible method for deer capture. More traditional methods use anesthetic darts. This method is considered infeasible for Fairfax County.

ii. Contraception

Steroidal/hormonal contraception has proved very costly and difficult to implement and only very marginally effective. Immunocontraception, on the other hand, holds some promise for deer management, but it is currently in an experimental stage. The Humane Society of the United States is conducting field studies at the enclosed National Institute of Standards and Technology site in Montgomery County, but due to difficulty with marking deer, the Humane Society is not yet conducting studies for free-ranging deer such as those in Fairfax County. The recent technical literature discusses requirements for sites chosen for pilot tests. All indications are that this is not a near term solution for the County but might hold promise for limiting populations in the future, once they have been reduced to desired levels.

2. Conflict Mitigation Approaches

Conflict mitigation is directed toward reducing the direct impacts of deer on the human population and thereby increasing the tolerance of the community for the existing deer

population.

a. Supplemental Feeding

Conceptually this approach is supposed to divert deer from the landscape plantings in gardens and yards. Supplemental feeding might somewhat improve the health of the existing deer population but would almost certainly drive it to even higher levels. Thus, consideration of this approach would be counterproductive for Fairfax County since it does nothing to reduce the excess deer population.

b. Fencing

Fencing is only rarely effective since deer are noted for leaping even eight-foot fences. Thus, fencing is a costly and ineffective solution, especially when deer are seeking out preferred plant species.

c. Repellants

Repellants have had some limited success but are generally costly and most require frequent replenishment. Also many of them have odors that are no more acceptable to humans than they are to deer.

d. Roadside Reflectors

Roadside reflectors divert light from vehicle headlights toward the sides of the roadway and are intended to frighten the deer away from the road, thereby reducing the likelihood of vehicle collisions. The method is useful in the evening and early morning hours when the majority of deer-vehicle collisions occur. While expensive, this technique has shown some promise in tests. The Virginia Department of Motor Vehicles has given the County a \$40,000 grant to conduct studies of the effectiveness of roadside reflectors. The first test site was a section of Telegraph Road that has had a high incidence of deer-vehicle collisions. The initial results show promise but are confounded by three other factors: (1) construction activity in the area may have driven many deer away, (2) a high incidence of epizootic hemorrhagic disease that may have naturally reduced the population, and (3) an archery hunting program at Fort Belvoir that definitely reduced the population in that area. The County staff has identified and begun testing at additional test sites, but these also have problems that render data interpretation extremely difficult.

e. Underpasses

Construction of underpasses has been suggested as a way of providing deer with a safe means of getting to the other side of busy roads. Not only is it exceedingly costly, but there are no data available now or expected in the future that would pinpoint likely

sites. This approach is regarded as wholly impractical.

f. Use of Less-Favored Plants

Landscaping with plant species that are less favored by deer has been advocated as a way of reducing depredation of yards and gardens. However, as Cypher & Cypher (1988) and numerous other wildlife biologists have shown, when deer populations exhaust the preferred plant species they readily turn to those less preferred. Thus, in the short term this approach might seem to work but longer-term experience indicates that it is relatively ineffective.

E. PUBLIC EDUCATION PROGRAM NEEDS

As noted above, an educated public that has an understanding of the population dynamics of deer, the concepts of carrying capacity, the different management options, and an understanding of the various values of the community in addressing ongoing management is essential to the successful implementation of a deer management program. The recommended public education program should:

- Use the County's established Deer Management web site (www.co.fairfax.va.us/comm/deer/deermgmt.htm) as a primary vehicle for making much of the information mentioned below more readily available and updatable.
- Develop pamphlets that are easily read and easily mailed, and make these pamphlets available through various County offices and through the local Supervisors' offices. These should include information on:
 - Deer and deer biology.
 - Ecosystem and population dynamics in general, and as they relate to the interaction between deer and their interactions with other species of both plants and animals.
 - Methods of population management, including their relative feasibility and cost-effectiveness for achieving both short-term and long-term goals.
 - The deer management program.
 - Permits required for implementation of private control measures.
 - Fencing and repellents.
 - Safe driving and how to avoid deer on the road.
 - Lyme disease and its prevention.
 - Who to contact for additional information.
- Establish networking among the following agencies for provision of consistent public information:

- Fairfax County Government offices.
 - Fairfax County Supervisors district offices.
 - Fairfax County Animal Control Division.
 - Nature Centers.
 - Health Departments.
 - State agencies, particularly Virginia Department of Game and Inland Fisheries and the Virginia Department of Transportation.
 - The Humane Society.
- Compile and make available a comprehensive bibliography of literature on deer management in urban environments. (The references attached to this section provide a limited example.) Make this information available to schools, civic and technical groups, and interested individuals.
- Establish an archive of evidence documenting how deer can change the characteristics of a landscape. This should show:
 - Habitat characteristics before deer damage.
 - Habitat characteristics during and after deer damage.
 - Habitat characteristics during regeneration after deer population is reduced.
 - Statistics and trends for vehicle/deer collisions, number of injuries/fatalities, and types of damage.
- Create a visual display of the above for use at schools, fairs, libraries, etc., and develop presentations for use at public meetings and meetings of civic groups.
- Establish a County self-service telephone number for wildlife problems and public information. This could be a menu driven hotline that would direct people to the proper location on the information network or to the appropriate County office.

F. PUBLIC AGENCY RESPONSIBILITY

The Division of Animal Control of the Fairfax County Police Department has been assigned primary responsibility for deer management by the Board of Supervisors. However, due to the legal concept that ownership and disposition of wildlife is vested in the state, the Virginia Department of Game and Inland Fisheries exercises significant regulatory and permitting functions that affect Fairfax County's deer management activities. The Division of Animal Control, in coordination with applicable land-holding agencies (e.g., Northern Virginia Regional Park Authority, Fairfax County Park Authority) and other public authorities, implements the Integrated Deer Management Plan on public lands. In addition, the Division of Animal Control advises private businesses and residents in addressing deer management on privately owned parcels in Fairfax County. Deer management on federally owned tracts of land within Fairfax County (e.g., Mason Neck National Wildlife Refuge, Fort Belvoir, etc.) is

the responsibility of the respective federal agencies and is subject to the applicable federal policies and regulations.

G. PROGRAM IMPLEMENTATION ACTIVITIES

An Integrated Deer Management Plan was developed by County staff subsequent to the Consultant Report received in December, 1997. In November, 1998, the Board of Supervisors directed that program implementation activities commence. Subsequently, in the summer of 1999, the County Executive convened a Deer Management Committee comprised of experts and various stakeholders to evaluate the plan and initial implementation efforts and to prepare recommendations for the Board of Supervisors for further implementation of the plan during the fall and winter of 1999-2000. This committee meets annually to review progress in program implementation and to make recommendations on additional approaches. The Division of Animal Control of the Police Department prepares the annual Fairfax County Deer Management Report to the Board of Supervisors that contains extensive data on the program. Additional material may be found on the County web site (www.co.fairfax.va.us/community/deer)

On December 8, 1997, the Fairfax County Board of Supervisors approved managed hunts for Riverbend Park and the Upper Potomac Regional Park, both in the Dranesville District. Plans by the Animal Control Division were approved by the Northern Virginia Regional Park Authority and the Fairfax County Park Authority for four managed hunts for each of the two locations. The hunts were planned for January and February of 1998. The managed hunts conducted in 1998 were largely unsuccessful in achieving planned program objectives and had associated costs that were difficult to justify. However, some of these costs could be attributed to greater-than-necessary safety measures that experience now indicates would not be needed in the future. In contrast, four managed hunts, involving 132 hunters, conducted in the fall and winter of 1999-2000 were very cost effective, with 195 deer taken at a cost per animal of \$9.51. The seven managed hunts conducted in the fall and winter of 2000-2001 involved 223 hunters, who took a total of 351 deer at a cost per animal of \$17.94. Of the 351 deer taken, 222 were donated to a program that feeds needy families.

The sharpshooter program, which utilizes Police Department Special Operations tactical teams, has been cost-efficient from the outset. These teams must engage in extensive marksmanship training on a regular basis in order to maintain the required proficiency. Instead of practicing on a target range, they are utilizing this required training time in a field setting with the deer more closely resembling operational targets. The harvested deer are collected by a charitable organization that provides meals to the needy. Even in the early part of the learning curve, this program has shown satisfactory harvest rates. Whereas similar programs in most mid-Atlantic jurisdictions have harvests listed in hours per deer taken, Fairfax County in 2000 had a harvest rate of 1.54 deer per hour. From late December 1999 through late January 2000, fourteen sharpshooting sessions over a total of 41 hours were conducted with a total harvest of 89 deer at a cost of \$4.15 per animal. In the same period of 2000-2001, there were

23 sharpshooter sessions, totaling 94.75 man-hours, which took 146 deer at a cost per deer taken of \$22.97. A major reason for this increase in cost per animal is that most of the sites this year represented repeat visits to locations first addressed last year. As the herd population density decreases, the time expended on each animal increases, and this is further increased by the increased wariness of the surviving members of the herd. Thus, the costs are very much in line with expectations and will drop once again as more new sites are brought into future years' mix of new and old locations.

Clearly, the managed hunt and sharpshooter programs must be conducted largely in parkland due to safety considerations, but this is also where some of the most substantial benefits are to be achieved. From the outset, the Northern Virginia Regional Park Authority has taken a position of active involvement and has reaped corresponding benefits. The Fairfax County Park Authority has been slow to become actively involved and avail itself of the clear benefits offered by the program to the ecology of its parks. It is to be hoped that in the upcoming deer management season the Fairfax County Park Authority Board and executive staff will much more directly involve the FCPA in the program and thereby exercise the ecological stewardship that is so necessary to the biotic health of our parks and parkland.

Out-of-season kill permits have, for some years, been one of the few legal avenues open to private property owners to permanently remove deer that are causing serious damage to their properties. Such permits are issued by the Virginia Department of Game and Inland Fisheries after verification of the damage. Generally, however, permits are only issued for holders of larger property parcels because of safety considerations. Fairfax County should work in coordination with the VDGIF to make these permits available on a wider basis to qualified residents.

The use of roadside reflectors (strieter-lite technology) that reflect automobile headlights into wooded areas bordering the roadside has been suggested as a method of discouraging deer from crossing roadways in the evening and early morning hours when most deer-vehicle collisions occur. In mid-November 1999, the Board of Supervisors approved \$10,000 for a pilot program to test strieter-lite reflectors in selected locations. In addition, a grant of \$40,000 was received from the Virginia Department of Motor Vehicles for testing and evaluation of this technology at several locations in Fairfax County. Unfortunately, all of the test locations experienced confounding factors such as roadway modification, adjacent development, deer herd reduction through hunting and disease, etc., that made it impossible to draw reliable inferences from the collected data. In addition, the manufacturer of the reflectors has apparently discovered that the initial design was reflecting light in a part of the spectrum to which deer's eyes are relatively insensitive, and the design is now being changed. Such inferences as can be drawn from the data suggest that there is only a slight reduction in deer-vehicle collisions due to the use of reflectors. This conclusion appears to be borne out by tests in other eastern areas where there was an absence of confounding factors.

Even though Fairfax County does not presently have a pilot project to test the feasibility of immunocontraception, this technology is showing significant potential for the future. A program being conducted by the Humane Society of the United States on the campus of the

National Institute of Standards and Technology in Montgomery County is being carefully monitored for possible applicability to Fairfax County. After the deer population has been reduced to generally acceptable levels, this methodology might provide a feasible method of sustaining these levels in local herds for the long term. In mid-November, the Board of Supervisors approved \$10,000 to develop a pilot demonstration program on deer contraception.

H. CONCLUSIONS

The need for a comprehensive deer management program for Fairfax County does not appear to be in serious dispute. However, there is perhaps a somewhat wider array of opinion about the appropriate context for determining carrying capacity level for the management program and the particular methodologies to employ in reaching program goals.

As noted in much of the reference literature, deer have traditionally been viewed as livestock and woodlands and meadows as pasture. Deer management models and programs have been based largely upon nutritional deer carrying capacity that does not consider issues of biodiversity, altered natural processes, natural herd demographics and behavior, or adverse impacts on mankind. The discrepancy of views can be seen in comparing a report by the Virginia Department of Game and Inland Fisheries with the recent Consultant Report. The VDGIF report states that deer densities ranging from 90-419 deer per square mile have been reported in various County parks and that ideal deer densities are 15-20 deer/sq. mile of suitable habitat. However, the 1997 Consultant Report and much of the scientific literature argues that a deer density of no more than 8-15 deer/sq. mile is required to meet a biodiverse goal of deer management. Many of the assumptions upon which the Integrated Deer Management Plan for Fairfax County is based need to be validated by further environmental assessment of the County and reconciled with more precisely defined ecological goals.

It is evident that, while deer in Fairfax County have not reached a state of overpopulation (as earlier defined), they are near biological carrying capacity as shown by their poor physical condition and their relentless foraging outside their "natural" habitat. It is equally evident that, for the majority of citizens, deer have greatly exceeded cultural carrying capacity in terms of representing a serious vehicular hazard and their depredations on both private landscaping and our public parklands. There is now substantial evidence documenting the fact that ecological and biodiversity carrying capacities have long since been exceeded.

In light of the Environmental Quality Advisory Council's role as an advocate for protection of environmental quality, it is EQAC's view that a biodiversity approach is needed in Fairfax County. However, as cautioned in the 1997 Consultant Report, EQAC too cautions against attempts to move forward with a response without adequate data, a clearly articulated plan, and education and consensus building of all major stakeholders. While moving quickly may assuage the concerns of some vocal groups, a true solution must address the problem with a long-term approach, considering all major stakeholders. Management must address an ecological goal that is based on sound science and considers the value system of an educated community.

All of these caveats having been noted, the problem has now reached such proportions that every feasible approach must be employed not only to keep the burgeoning deer population in check, but more important, to systematically reduce it to sustainable levels. It is evident that the current managed hunt and sharpshooter programs have reached an admirable level of cost-effectiveness but are not reducing the countywide deer population at a rate sufficient to achieve the recommended biodiversity carrying capacity. Thus, it is incumbent upon the Board of Supervisors to continue to take increased and decisive action to address this problem over the long term, while recognizing that it is not going to be possible to please all of the people all of the time. It is likewise incumbent upon the Fairfax County Park Authority to much more actively participate in the deer management program in order to exercise the necessary stewardship of the ecological well being of the County's parkland.

I. RECOMMENDATIONS

1. EQAC recommends that the Board of Supervisors continue to implement and monitor the comprehensive deer management program set forth in the Integrated Deer Management Plan adopted in November, 1998 and refined by the Deer Management Committee in the summer of 1999. EQAC strongly supports the following broad goals encompassed in the plan and in the subsequent studies and evaluations:
 - Management based on reduction of local deer populations to sustainable levels.
 - Management based on a sound ecological approach that emphasizes biodiversity without preferential treatment of particular species.
 - Management based on an "in perpetuity" perspective that does not trade long-term interests for short-term gains.
 - Protection, restoration, and enhancement of the natural areas and environments that have been subjected to degradation by deer overabundance.
2. EQAC strongly endorses on-going public input into the Deer Management Plan, including surveys of public opinion and the inclusion of major stakeholders (home owners, environmental preservationists, public safety experts, wildlife biologists, public health experts, sport hunting groups, animal rights groups, etc.) in the refinement and implementation of the plan. EQAC fully supports continuation of both the input of a broad range of views and the use of spokespersons who can articulate program goals and the ongoing management approach to the varied community groups and viewpoints.
3. EQAC strongly recommends increased participation of the Fairfax County Park Authority in the deer management program in order to provide improved stewardship of the parks,

golf courses, and other parklands under its care and management. To this end, EQAC requests the Board of Supervisors to share with the Park Authority EQAC's concern about the current level of participation of the FCPA.

4. EQAC believes that, in addition to the measures implemented on public lands, the management program must address the problems of small private (mostly residential) property owners who are suffering serious impacts from deer and develop means for them to legally exercise effective control measures.
5. EQAC believes that the management program must accomplish, at a minimum, the following key objectives:
 - Immediate and sustained reduction of the deer population in order to return the size of the local herds to levels consistent with the long term carrying capacity of their particular local habitats.
 - Ongoing monitoring of availability of methods for maintaining population limits over the long term, such as the promising, but still experimental, immunocontraception method.

- Consideration of development in the County and its effects on ecosystem health and biodiversity as these relate to deer management as well as to the quality of life generally.
6. Since public acceptance of management programs is more easily achieved when there is full public understanding of the problem, the available management options, and their costs and other consequences, EQAC urgently recommends that the Board of Supervisors continue to provide for a vigorous and enhanced program of public education.

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LIST OF REFERENCES

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